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Enamel Units of Storage Water Heaters

储水式热水器搪瓷制件

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Enamel Units of Storage Water Heaters

1 Scope

This Document specifies the requirements, inspection rules, marking, packaging, transportation and storage of enamel units of storage water heaters, describes the corresponding test methods, and defines relevant terms and definitions.

This Document applies to the production, inspection and sales of enamel units of storage water heaters, such as water-stored electric water heaters, heat pump water heaters, solar water heaters, gas water heaters with a rated capacity of no more than 1000 L.

2 Normative References

The provisions in following documents become the essential provisions of this Document through reference in this Document. For the dated documents, only the versions with the dates indicated are applicable to this Document; for the undated documents, only the latest version (including all the amendments) is applicable to this Document.

GB/T 2828.1 Sampling procedures for inspection by attributea-Part1:Sampling schemes indexed by acceptance quality limit(AQL) for lot-by-lot inspection

GB 4706.12 Safety of household and similar electrical appliances - Particular requirements for storage water heaters

GB/T 4956 Non-magnetic coatings on magnetic substrates - Measurement of coating thickness - Magnetic method

GB/T 9989.1 Vitreous and porcelain enamels - Determination of resistance to chemical corrosion - Part 1: Determination of resistance to chemical corrosion by acids at room temperature

GB/T 9989.2 Vitreous and porcelain enamels - Determination of resistance to chemical corrosion - Part 2: Determination of resistance to chemical corrosion by boiling acids, boiling neutral liquids and/or their vapors

GB/T 9989.3 Vitreous and porcelain enamels - Determination of resistance to chemical corrosion - Part 3: Determination of resistance to chemical corrosion by alkaline liquids using a hexagonal vessel

5 Test Methods

5.1 Enamel coating thickness

The test shall be carried out according to the provisions of GB/T4956, with no less than 5 different test points per square meter. The measurement results shall report the maximum value, minimum value and arithmetic mean value.

5.2 Adhesive strength

The test shall be carried out according to Appendix A.

5.3 Temperature jump resistance and

5.3.1 Preparation of specimen

When the product cannot be used directly for testing, a specimen with a side length or diameter of (105 ± 5) mm shall be made.

The specimens shall be cut at different parts of the enamel product by a manual saw, cutter or appropriate cutting tool. The edges shall be neat and shall not cause cracking of the enamel. The enamel surface shall meet the requirements of 4.4. Or the specimen is made of the same material as the main components of the liner under test and take the same pre-treatment, enameling, drying and firing processes. For example: the specimen and the water heater liner are produced together and hung flush in an enameling furnace to burn or burn in a laboratory furnace. If required for enameling, a hole with a diameter of 5 mm can be drilled at the corner of the specimen, and the center distance from the edge shall be ≤ 4 mm.

5.3.2 The quantity of specimen

The quantity of specimen selected for temperature jump resistance is no less than 3 pieces.

5.3.3 Test procedures

Heat the specimen in air to (200±10) °C. After maintaining the temperature for 20 min, put it into cold water with a temperature of approximately (15 ± 2) °C within 5 s. The specimen shall be completely immersed. After cooling, take out the specimen and observe the surface condition of the specimen. If there are no cracks, allow the specimen to dry. Repeat the above operation 5 times.

There shall be a sufficient amount of cold water used in the test, and the temperature rise of the cold water during the test shall not exceed 1K.

Damage to the specimen due to cutting is not taken into account.

5.4 Acid erosion resistance

5.4.1 Test position

The test position is the part in contact with hot water. If it is difficult to test at this position, select other corresponding positions or specimens made with the same process.

5.4.2 Test procedures

The test shall be carried out in accordance with the provisions of GB/T 9989.1. The test solution is 10% (mass fraction) hydrogen chloride (HCI) solution, and the test time is 1 h.

5.5 Hot water erosion resistance

5.5.1 Ambient temperature

(22±5)°C.

5.5.2 The number of tests

Conduct at least 3 parallel experiments each time.

5.5.3 Preparation of specimen

The specimen shall be prepared according to 5.3.1. The back of the specimen shall be coated with a thin layer of enamel or other coatings to prevent corrosion.

For a specimen with steel sheet thickness exceeding 2.1mm, its mass may exceed the weighing range of an analytical balance with general range of 200g (accuracy of 0.2mg). In this case, a special balance with the same accuracy, and larger range shall be used for weighing.

5.5.4 Pre-treatment and installation of specimen, and test device

It shall comply with the provisions of GB/T 9989.2. Glass parts used for the first time in the device shall be soaked in boiling water for more than one week, and the water shall be changed every day.

5.5.5 Test solution

The test solution is deionized water with conductivity ≤1 mS/m.

5.5.6 Test procedures

Inject 450mL of test solution into the test device. The liquid level shall be above the upper edge of the heater (about 95 mm high from the lower edge of the glass cylinder).

When the solution begins to boil, adjust the temperature control device so that the amount of condensate in the reflux condenser in the graduated collector is maintained between (8 ± 2) mL every 3 min.

The test solution is replaced repeatedly in the following manner:

--- From the 1st to the 5th day, change once every 24 h;

--- Continuous testing on the 6th and 7th days without replacement;

--- Repeat the above procedure to replace the test solution in the 2nd and 3rd weeks.

The test is divided into two phases, each phase last 21 days (504 h).

After each test phase is completed, remove the specimen, rinse it with distilled water, dry it for 2 h in the temperature range of (110 ± 5) °C, and immediately transfer the specimen to a desiccator. Allow the test specimen to cool to room temperature, and weigh the mass of each sample, and accurate to 0.1 mg.

The arithmetic mean of weight loss per unit area in the second test stage is used as the basis for the entire test evaluation.

If the difference in weight loss per unit area of each specimen is greater than 20% of the arithmetic mean, conduct the test again and take the arithmetic mean of the 4 values as the basis for test evaluation.

5.6 Alkali erosion resistance

The test shall be carried out according to the method specified in GB/T 9989.3. The test solution is 5% (mass fraction) anhydrous sodium carbonate (Na_2CO_3), the test temperature is (80 ± 1) °C, and the test time is 6 h.

5.7 Pressure resistance

Fill the liner with water and pressurize it to a test pressure of 1.3*P*. *P* is the rated pressure specified in GB 4706.12. The pressure increases from 0 to *P* for at least 15 s, and from *P* to test pressure for no more than 5 s. The pressure is maintained for at least 15 min. The test was conducted for a total of 2 times.

Check the surface quality of the enamel and whether there are leaks in the liner.

5.8 Migration of lead and cadmium

5.8.1 Specimen pretreatment

The specimen shall be pre-treated according to the following procedures:

a) Clean the specimen with weak alkaline detergent, then rinse it repeatedly with tap water, rinse it with distilled water or deionized water, and dry it;

b) Inject 4% (volume fraction) acetic acid solution, and the liquid level shall be no less than 5 mm from the edge of the specimen port. Record the volume of the soaking solution

6.2 Type inspection

6.2.1 When one of the following situations occurs in the production situation, type inspection shall be carried out:

a) When designing new products or improving original products;

b) When there are major changes in the production process, such as when there are major changes in raw and auxiliary materials, when equipment is replaced or when production is resumed after a shutdown;

c) When there is a big difference between the exit-factory inspection results and the last type inspection results;

d) After production has been carried out for a certain period of time or a certain output has been achieved, for example: once every six months;

e) When requested by the national quality supervision agency or user.

6.2.2 Type inspection shall be conducted item by item according to all items in Clause 4 of this Document, and the test method shall be carried out in accordance with the provisions of Clause 5.

6.2.3 All inspection items during type inspection shall be qualified. If one item is unqualified, the type inspection is unqualified.

7 Marking, Packaging, Transportation and Storage

7.1 Marking

7.1.1 Each product shall be marked with the following information, such as product name, manufacturer name, address, trademark, specifications, model, product certificate, usage and installation instructions and precautions (if it is marked for two years usage, the supplier shall send for professional staff to check the anode bar, clean the liner, etc.).

7.1.2 The outside of each package shall be marked with the following information, such as the product name, specifications, quantity, quality, volume, and words and signs such as "Fragile Items", "Afraid of Rain" and "Upward".

7.2 Packaging

Choose appropriate packaging to make the product less likely to be damaged.

7.3 Transportation

Products shall be protected from violent vibrations and collisions during transportation.

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